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MOUNTAIN PINE BEETLE CONDITIONS
IN THE LODGEPOLE PINE STANDS
OF FOREST SERVICE REGION 4

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R. I. Washburn and J. A. E. Knopf, Entomologists

DIVISION OF FOREST INSECT RESEARCH
INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
Reed W. Bailey, Director
Forest Service
U. S. Department of Agriculture
Ogden, Utah

MOUNTAIN PINE BEETLE CONDITIONS IN THE LODGEPOLE PINE STANDS
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By

R. I. Washburn and J. A. E. Knopf - Entomologists

INTRODUCTION

The mountain pine beetle, Dendroctonus monticolae Hopk., is the most serious insect enemy of lodgepole pine in southern Idaho, western Wyoming, and Utah. Records show that lodgepole pine stands of this region have been subjected to many serious epidemics in the past. One highly destructive outbreak started in 1923 and extended across the Challis, Boise, and Payette National Forests. It continued until severe low temperatures during the winter of 1932-1933 brought the epidemic under control. Over half of the lodgepole pine on many extensive areas was killed. Another, called the Targhee-Teton epidemic, covered most of 4 national forests and Grand Teton National Park and continued from 1946 through 1950. The effort and results of the large-scale control program directed against this epidemic are well known. From 1950 until 1955 the mountain pine beetle remained relatively quiescent throughout the lodgepole pine stands of Region 4.

In November 1956 entomologists of the Intermountain Forest and Range Experiment Station predicted a possible rapid increase in mountain pine beetle activity in the lodgepole pine forests.^{1/} As predicted, new epidemic centers developed and enlarged to a point where the 1958 surveys showed 22 serious epidemic infestations on 5 national forests, 1 national park, as well as State, private and some Bureau of Land Management lands.

This report has been prepared to consolidate the information available on all known active epidemic centers and present an over-all picture of mountain pine beetle activity in the vast lodgepole pine forests of Forest Service Region 4.

A map of the lodgepole pine forests showing the relative position of the infestations as well as more detailed maps of each infestation will be found at the end of this report.

^{1/} Official correspondence. (RX-INT, INSECT SURVEY PROGRAM, Report, Mt. Pine Beetle - S, CONTROL, Insects) - November 8, 1956.

SAWTOOTH NATIONAL FOREST

A. Active infestations of mountain pine beetle have been observed for the past few years within drainages of Big and Little Smokey Creeks and South Fork of the Boise River on the Sawtooth National Forest.

In 1957 a definite increase in the number of dying lodgepole pine trees was noted and an appraisal survey was undertaken. Survey data showed approximately 2,158±531 infested trees and in the spring of 1958 a total of 2,781 trees were sprayed. Surveys in 1958 were run to evaluate the effectiveness of spraying and to determine the location and intensity of any new infestations.

Four units were surveyed in 1958.^{2/} They were, Unit A, Big-Little Smokey Creeks - 2,132 acres, 699±170 infested trees (systematic survey) and 7,000 acres, approximately 280 trees (scouted); Unit B, Warm Spring Creek - 4,086 acres, 239±118 infested trees (systematic survey), 3,000 acres approximately 100 infested trees (scouted); Unit C, South Fork Boise River - 4,000 acres, 18 infested trees (scouted); Unit D, West Pass Creek - 1,300 acres, 350 infested trees (scouted).

Mountain pine beetle infestations have been considerably reduced within the Big-Little Smokey drainages. A threat, however, of continuing beetle damage exists within the nearby Warm Spring drainage and within West Pass Creek near Bowery Flats. These infestations are somewhat concentrated at the present and could act as the nucleus for future widespread flare-ups within lodgepole pine stands along the Boise River.

KILGORE, IDAHO

B. Three small spot infestations of mountain pine beetle have been present in the vicinity of Kilgore, Idaho for several years. Examination through 1956 revealed that these hot spots were neither showing increasing tendencies nor enlarging rapidly. However, examination in the fall of 1957 revealed a brood potential that indicated a possible increase in 1958.^{3/} Preliminary examination in November, 1958, of the infestation on State, Federal and private land in the vicinity of Kilgore showed an apparent increase in beetle activity.

^{2/} Cole, W. E. Appraisal survey, mountain pine beetle infestation, Sawtooth National Forest, Idaho. Intermountain Forest and Range Experiment Station. 5 pp., (Processed) 1958.

^{3/} Washburn, R. I. Mountain pine beetle infestation, private land, Kilgore, Idaho. Intermountain Forest and Range Experiment Station. 1 p., (Processed) 1957.

In December, a more complete biological evaluation was made of the three infestations (Sheridan Reservoir, Antelope Valley, and Fish Hatchery) which confirmed the suspicion that the infestation had reached epidemic status. In connection with the evaluation, an estimate of the approximate size of the infestation was made. Approximately 3,650 lodgepole pine trees are now infested which represents a marked increase over last year's estimate.

Sampling of the brood showed larval population averaging 191 per square foot of sample at breast height, with an attack density of 8 per square foot which is slightly less than found on the other infestations now active in the lodgepole pine forests. Nevertheless, larval density is sufficient to cause a decided increase in the subsequent adult population provided larval survival follows the expected pattern.

TARGHEE NATIONAL FOREST

C. The Targhee National Forest lodgepole pine stands have a long history of mountain pine beetle epidemics but have been free of noticeable infestations for the last few years. Aerial detection surveys in 1958 located several areas suspected of containing new centers of infestation. Subsequent ground inspections confirmed the fact that mountain pine beetle populations were present in epidemic numbers.

Biological evaluations were conducted in several areas and in addition rough estimates were obtained for two units. The Hawley Gulch infestation is approximately 600-800 acres in size with about 500-600 infested trees. The Carlton Creek and Flat Hollow infestation covers about 1,000 acres and contains approximately 1,100 infested trees. At present, the infestation centers are building up rapidly and probably will continue to increase in intensity for the next few years. Broods in all of the infested areas were heavy and healthy with low counts of predators and parasites. Brood density was high, averaging 271 half-grown larvae per square foot at breast height, which makes an average of 21.2 larval progeny for each pair of parent adults when compared with the recorded attack density of 12.8 points of attack per square foot.

It was not possible to make a ground appraisal on two of the areas where aerial surveys indicated mountain pine beetle activity. These areas located along the edges of timber type, one in the vicinity of Judkin, Idaho and the other bordering Antelope Valley, will be inspected next spring.

GRAND TETON NATIONAL PARK

D. Chemical treating programs to control mountain pine beetle epidemics in Grand Teton National Park were conducted between 1947 and 1951. From 1951 to 1955 bark beetle populations remained at relatively low levels. Since 1955 a steady increase in mountain pine beetle populations has been observed and control operations were carried out in the spring of 1957 and 1958.

In 1957, 2,180 acres were infested with a total of 1,142 trees and 1958 surveys disclosed an increase to 4,068 acres with 3,360 attacked trees.^{4/}

The five areas covered in 1958 by a 5 percent survey were as follows:

1. Signal Mountain - 1,792 acres, 980±298 infested trees
2. East Signal Mountain - 654 acres, 1,040±354 infested trees
3. Pacific Creek - 382 acres, 880±472 infested trees
4. Two Ocean Lake - 412 acres, 140±119 infested trees
5. Jackson Lake - 228 acres, 280±254 infested trees.

Elk Ranch, a sixth unit covering 600 acres, was scouted and 40 infested trees found.

Biological data collected during the survey gave an average of 8.97 points of attack and 531 half-grown larvae per square foot. This density of attack and brood population, coupled with an apparent lack of host resistance and low numbers of parasites and predators, indicates that infestation centers have reached epidemic status.

Throughout areas where control measures have been applied, significant reductions in mountain pine beetle broods have been effected. On units where the bark beetle potential is high, however, the buildup ratio is so great that beetles flying from the few "missed trees" successfully attacked large numbers of green trees. In some cases the number of newly attacked trees exceeded the number that were treated this spring.

From the entomological standpoint, it would be desirable to control these rather serious bark beetle infestations while they are still relatively small to prevent rapid expansion, both in area and intensity which is a distinct possibility, judging from current biological evaluations.

TETON NATIONAL FOREST

E. The majority of the timber on the Teton National Forest is lodgepole pine, a high percentage of which is large enough in diameter to be suitable host material for mountain pine beetle. The mountain pine beetle remained at a low level from the completion of the Targhee-Teton project in 1950 until 1955. In September of 1955 a "hot spot" showing epidemic tendencies was detected in the Dell Creek drainage which runs into the Hoback River. In 1956 a total of 3,483 lodgepole pine trees were treated in the Dell Creek area resulting in a 90 percent reduction in numbers of infested trees.

^{4/} Washburn, R. I. and J. A. E. Knopf. Mountain pine beetle conditions, Grand Teton National Park, appraisal survey. Intermountain Forest and Range Experiment Station. 4 pp., (Processed) 1958.

The fall survey in 1956 revealed new centers of infestation in west Shoal Creek and Sand Rock Creek in the Hoback drainage and in Ditch Creek just north of the Gros Ventre River. All centers of infestation were chemically treated in 1957.

The aerial survey of the Teton National Forest conducted in the fall of 1957 revealed two new centers of infestation along the west facing slope of Antelope Mountain, just east of the Snake River between Ditch Creek and Spread Creek. All centers of infestation were appraised by ground crews. Units chemically treated in 1957 were surveyed in the fall of 1958 using a systematic line-plot survey. Estimates for new centers of infestation were obtained by Station personnel.

In the Gros Ventre River drainage several areas were checked for suspected mountain pine beetle activity. They were Goosewing Creek, Little Cow Creek, Bridger Creek, Lloyd Creek, and Lafferty Creek. Investigations pointed up a relatively high incidence of mistletoe, commandra rust and in some areas moderate to heavy porcupine feeding. Mountain pine beetles were present only in what appeared as endemic numbers.

Rimdraw Creek, Sledrunner Creek, Fisherman Creek, and the Kismet Peak region were checked along the Hoback River drainage. No new centers of mountain pine beetle activity were detected.

Operational surveys conducted in the fall of 1958 by Teton National Forest personnel covered Dell Creek, Sand Rock Creek, West Shoal Creek, Antelope Mountain, Lost Creek, and Ditch Creek. A total of 2,000 acres was covered and 900 infested trees tallied. Treating programs during the past three years have been successful, however the few untreated trees produced enough brood to maintain the infestation potential at a fairly high level, particularly in the vicinity of Antelope Mountain.

WASATCH NATIONAL FOREST

F. This year saw the initiation of a control program directed against the large-scale mountain pine beetle infestation on the north side of the Wasatch National Forest. This infestation has been active at epidemic levels for at least the last 10 years. The 1957 survey showed that the infestation covered about 146,000 gross acres and contained over 110,000 infested trees. Control efforts this year were directed toward the retention of the infestation within the present epidemic area and destruction of mountain pine beetle brood in the control areas through ground application of toxic chemicals. Altogether 50,872 trees were treated in the spring and summer project. Biological data collected throughout the field season to appraise the bark beetle potential shows that broods are still at epidemic levels with a definite tendency to increase. Details of the biological evaluation will be reported separately after the analysis data has been completed. However, an indication of the potential

that exists is evident in the average figures obtained from population density measurements. These figures recorded by use of standing tree cages, show the attack density of 1957 was very heavy, averaging 16.24 attacks per square foot, which of course required 32.48 parent adults. The average number of progeny emerging as new adults was 45.5 per square foot, or roughly 50 percent more beetles emerged in 1958 than had attacked as parents in 1957. Operational surveys conducted by the forest estimates there are now 89,000 infested trees within the epidemic area. On the basis of biological findings and the presence of large numbers of infested trees, a continuation of the control program can easily be justified from the entomological standpoint.

ASHLEY NATIONAL FOREST

G. Mountain pine beetle infestations on the Ashley National Forest include only one that has reached epidemic status. This center is located in Pole Creek and was first treated in 1957. The program included the removal of merchantable infested material by loggers and the chemical treatment of the smaller or inaccessible infested trees. During 1958 additional control action was carried out on the Pole Creek infestation which covers 4,000 acres. Fall operational surveys estimated 1,200 trees now infested.

Other areas that are known to have threatening populations and that have been kept under surveillance are Hells Canyon, Lake Fork, and Upper Yellowstone. Annual aerial detection surveys in 1958 indicated that mountain pine beetle populations were not spreading into new areas. It should be noted, however, that the number of infested trees appears to be approximately of the same concentration as last year, indicating no appreciable decline in the infestation potential.

DISCUSSION AND RECOMMENDATIONS

Surveys of the lodgepole pine forests of Forest Service Region 4 and adjoining timbered lands show quite a number of epidemic infestations of mountain pine beetle. The infestations are scattered throughout the range of lodgepole in the region and vary in size from small centers of several hundred infested trees to the large-scale epidemic on the Wasatch National Forest that has nearly 90,000 trees currently infested. Control action undertaken against some of the infestation centers has resulted in satisfactory reductions in beetle population and in some cases the number of infested trees has been greatly reduced. A majority of the infestations reached epidemic status within the last 3 years and about one-third of these have not been subjected to any control action. In all of the epidemic centers the bark beetle shows a definite increasing tendency.

We are not in a position to explain the cause of this widespread buildup of the mountain pine beetle, but are aware of the following similarities that are common to all of the epidemic centers.

1. The centers have built up in place and have not resulted from "blow in" or spread from other epidemics. There are, of course, some examples of spread within an epidemic center.
2. The "hot spots" are not located inside vast bodies of lodgepole pine but commonly occur on the outside boundaries of the stands or in small islands of type near large bodies of lodgepole.
3. Invariably, the epidemics have gotten their start in full-crowned trees, but not necessarily the oldest or biggest, usually located on the outer edge of the timber bordering open range land, or lake and stream shores.
4. The epidemic centers are characterized by groupwise attack and in most cases have built up in an explosive manner, with a large buildup ratio being the rule about the 3rd year of the buildup.
5. The attack density (number of successful gallery starts per square foot at breast height) shows all infestation centers have between 8 and 16 gallery starts per square foot. The Kilgore infestation is lowest with 8, and the Wasatch highest with 16.24 per square foot.
6. Brood counts taken of the larvae this fall show brood density is heavy in all epidemic centers, ranging from 531 per square foot in Pacific Creek on Grand Teton National Park to just over 190 in the infestation near Kilgore, Idaho. Most of the epidemic centers have an average fall brood density in the range of 200 to 300 per square foot.
7. Obvious parasites and predators are at a low level in all epidemic centers.

In evaluating an infestation, reliance is placed on cumulative knowledge of previous case histories. Most serious epidemics showing increasing tendencies in lodgepole pine stands of R-4 show from 5 to 10 points of attack or 10 to 20 parent adults per square foot of bark area at breast height. Systematic weekly recording of brood development on the Wasatch and Teton National Forests show that fall larval densities of 200 or more can, where there is a scarcity of obvious predators and parasites, produce 45 or more mature adults per square foot. Unfortunately, we know nothing about the extent of loss of adult beetles in flight, but have observed quite a number of examples where an emerging population of 40 to 50 per

square foot at breast height has resulted in a decided increase in the number of infested trees whenever the size of the trees remained about the same.

On this evaluation basis the present infestations must all be classified as epidemic in character; each having the potential to increase in severity.

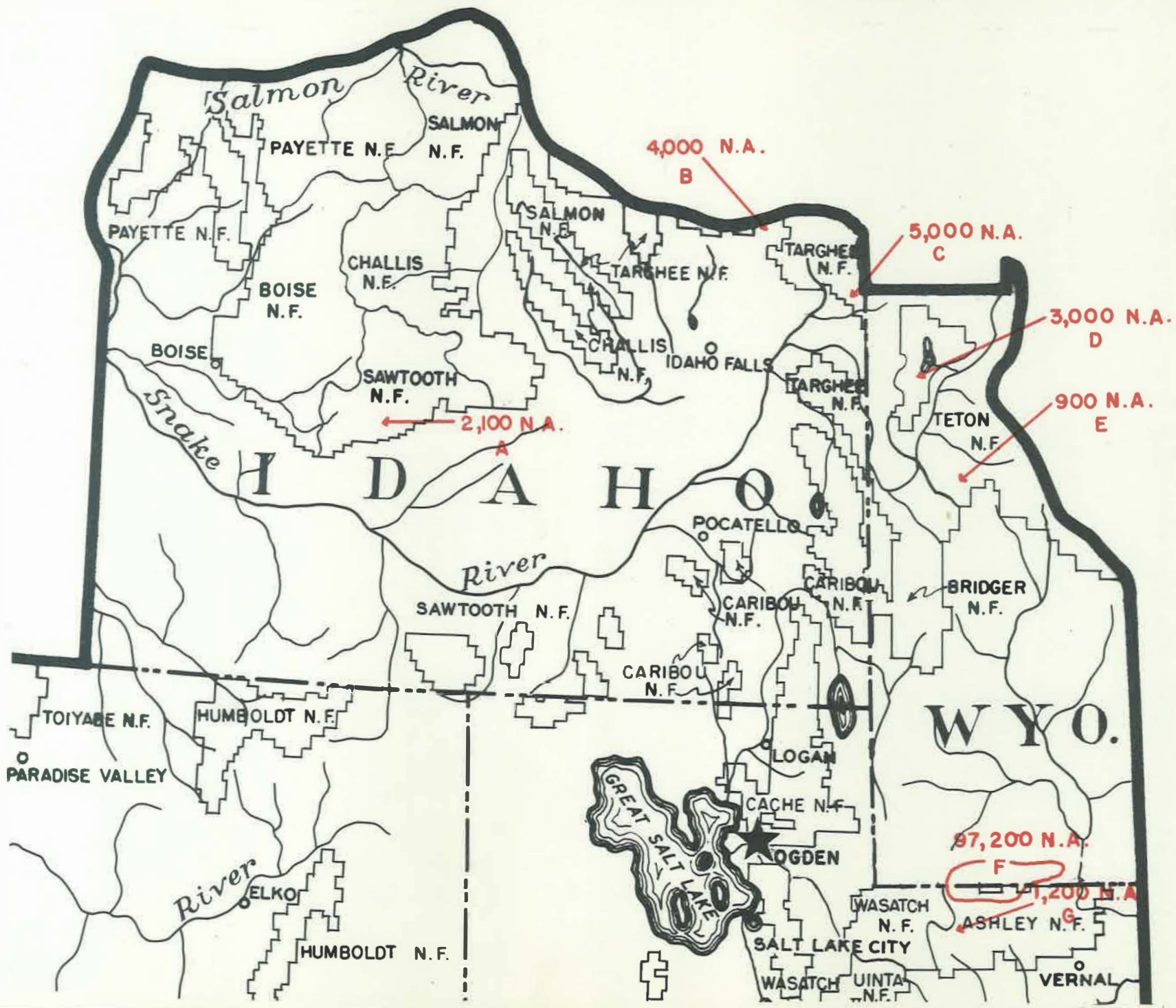
Summation of the seriousness of the present mountain pine beetle situation in the lodgepole pine forests of Region 4 shows:

1. Each epidemic center represents a serious threat to the lodgepole pine stands in the immediate vicinity of the center.
2. The sum total of the epidemic centers, widely scattered as they are, poses a threat of a possible widespread epidemic of tremendous size.

Therefore, it is the opinion of the entomologists of the Intermountain Station that unless an immediate effort is made to materially reduce the beetle population in all these infestation centers, heavy losses of lodgepole pine can be expected.

LODGEPOLE PINE AREA - FOREST SERVICE REGION 4

N.A. = NO. NEW ATTACKS
(Infested trees)



LEGEND



DRAINAGES



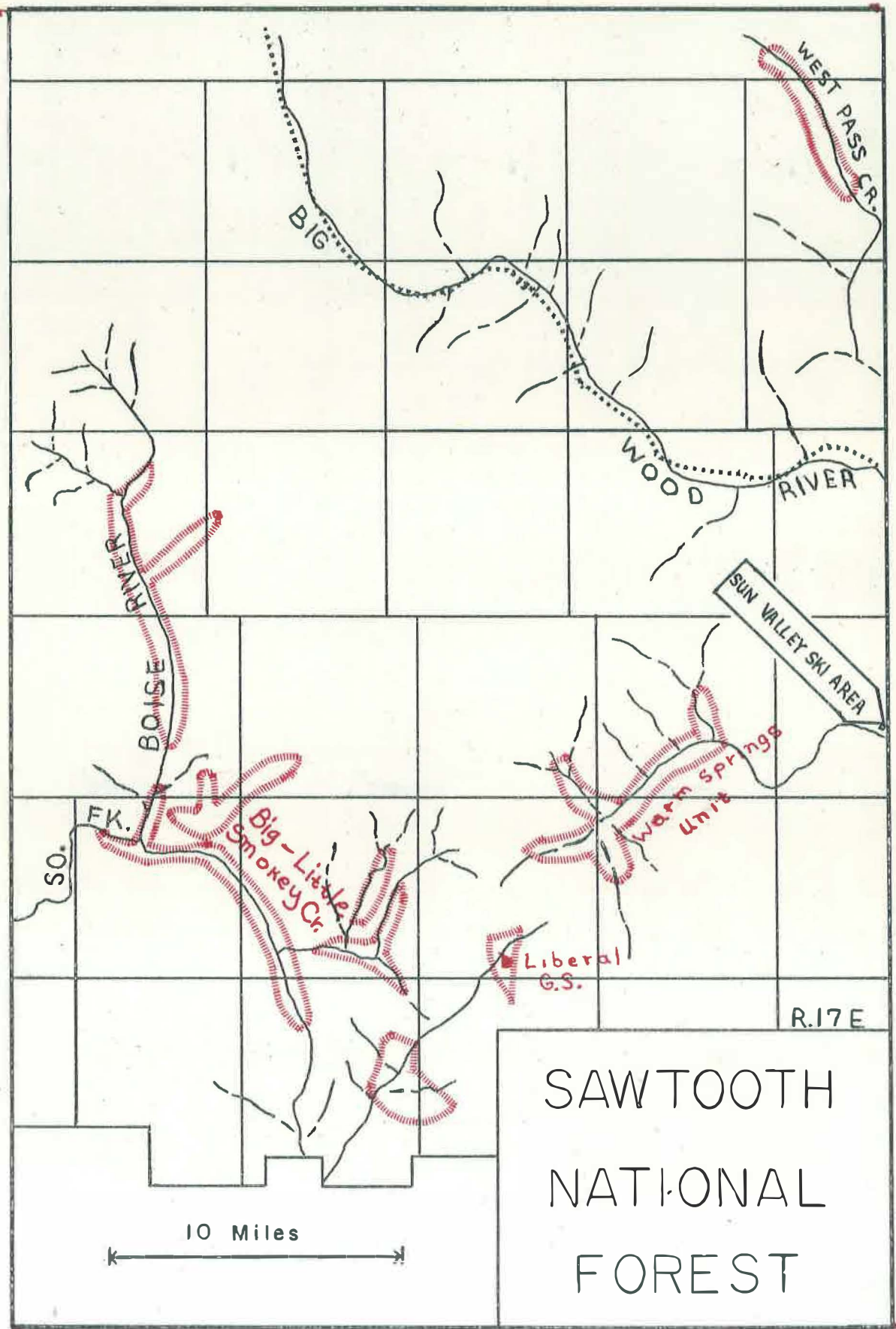
INFESTATION BOUNDARIES.



ROADS

NOTE

INDIVIDUAL MAPS VARY AS TO SCALE



TARGHEE NATIONAL FOREST

